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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/560,967	12/16/2005	Shousei Yoshida	M1909.1139	1666

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EXAMINER	
DAO, MINH D	

ART UNIT	PAPER NUMBER
2618	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/560,967	YOSHIDA, SHOUSEI	
	Examiner	Art Unit	
	MINH D. DAO	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 February 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 02/21/08 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al (US 6,493,379 B1) in view of Kobayakawa et al (US 6,064,338) and further in view of Ishida (US 2001/0019952).

4.

Regarding claim1, Tanaka discloses an adaptive antenna reception method, in which the directional beam of an array antenna (71-0 to 71(m-1) of fig7) consisting of a piurality of antenna elements (#0 to #(m-11) of fig.7) is adaptively formed to receive a desired signal (i.e. signal coming from antenna) and reduces (i.e. suppress) interference signals, multiplexed (78 of fig.8) signals transmitted from a plurality of senders, and the desired signal is corrected based on transmission channel estimation (fig.7,col.1 lines 8-29), the method comprising: the first step of adaptively calculating and updating the antenna weight coefficient (a0-a3 of fig.5) by cross correlation calculator (55 of fig.5) , multiplier (41 to 44) and adder (54) according to arrival signals(z0 to z3 of fig.5) received by the respective antenna elements and an error signal (i.e. signal have an interference parameters) obtained from the desired signal corrected (calculated by weight coefficient unit 55 of fig.5) based on the receiver channel feedback information (i.e. transmission channel estimation)(see fig, 1-7 col.8 lines 38-48); the adaptive antenna reception is used cross correlation function for calculating weighting coefficient (aO-a3 of fig.5) that indicate the arrival direction, and while matching the phase with the estimated arrival direction (i.e. maintain arrival angle constant or same) of the desired signal (see fig.4 and col.9 lines 39- 67).(since stable beam forming performed based on

arrival direction which is depend on phase variation therefore, if phase matched with arrival and desired signal thereby maintain beam gain same or constant);

the third step of receiving the desired signal through the array antenna using the antenna weight which has undergone the arrival direction estimation unit for calculating weight coefficient in the second step (see fig. 1 and col. 10 lines 14-21);

the fourth step of estimating the transmission channel (at the channel receiver unit for transmission) of the desired signal received in the third step to correct the desired signal based on the estimation result (see fig. 1-7.col. 10, lines 10-34).

But Tanaka failed to disclose explicitly constraint process. However, Kobayakawa teaches array antenna system (same field of endeavor) wherein plurality of antenna, adaptive weight control section calculates a adaptive weight s for obtaining in phase correlation signal from the respective antenna output (see fig.1 and abstract,col.6 lines 7-58).

Kobayakawa further teaches for calculating adaptive weights for each antenna elements using a directional constraint vector C and a covariance matrix which makes the phase of all correlation signal the same (i.e. constant) (see fig.9 step 204, fig.12 A and co1.5 lines 1-6,col. 10 lines 4-8,co1.11 lines 46-67,col. 12 lines 1-64).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the adaptive antenna weight calculation based on the signal received by the respective antenna elements (as taught by Tanaka) by adaptive weight calculation performed by adaptive weight control section using directional constraint technique to maintain desired signal phase same as arrival direction (i.e. gain same) (as taught by Kobayakawa) to enhance communication quality by reduction of interference using directional calculation constraint to calculate adaptive weight.

Still regarding claim 1, Tanaka and Kobayakawa do not disclose adaptively updating antenna weight based on minimum mean squared error (MMSE) control. Ishda, in an analogous art, teaches an adaptive array antenna device with the directivity pattern changed in accordance with a movement of each mobile station so as to minimize interference caused by other connections and maintain good transmission quality. The directivity pattern is controlled according to a minimum mean squared error (MMSE) method so that the wireless base station can correctly separate and extract a signal sent from each mobile station, and suitably direct the directivity pattern to each mobile station to send a signal (see abstract; figs.1-9; paras [0004-0032]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the MMSE method to update the antenna weight in order for the base station to correctly separate and extract a signal sent from each mobile station as taught by Ishda.

Regarding claim 2, as discussed above with respect to claim 1,Tanaka further discloses the adaptive antenna reception is used cross correlation function for calculating weighting coefficient (a0-a3 of fig.5) that indicate the arrival direction, and while matching the phase with the estimated arrival direction (i.e. maintain arrival angle constant or same) of the desired signal (see fig.4 and col.9 lines 39- 67).

(since, stable beam forming performed based on arrival direction which is depend on phase variation therefore, if phase matched with arrival and desired signal thereby maintain beam gain same or constant); and Kobayakawa teaches for calculating adaptive weights for each antenna elements using a directional constraint vector C and a covariance matrix which makes the phase of all correlation signal the same (i.e. constant) in the arrival direction of the desired signal (see fig.9 step 204, fig.12 A and col.5 lines 1-6,col.10 lines 4-8,col.11 lines 46-67,co1.12 lines 1-64).

Regarding claim 3, as discussed above with respect to claim land 2 and Tanaka furthermore discloses obtaining a correlation value between signals received by the respective adjacent antenna elements and calculating the average of the correlation values (see fig.1,4 and col. 9 lines 1-9);

calculating the arctangent of the average correlation value (see fig.5 and col. 9 lines 25-38);

and arrival angle (phase) obtained from the correlation function which can be used for calculating a direction based on the arrival angle (see fig.4 and col. 9 lines 39 - 66).

Kobayakawa teaches for calculating adaptive weights for each antenna elements using a directional constraint vector C and a covariance matrix which makes the phase of all correlation signal the same (i.e. constant) in the arrival direction of the desired signal (see fig.9 step 204, fig.12 A and col.5 lines 1-6,col.10 lines 4-8,col. 11 lines 46 - 67,col. 12 lines 1-64).

Regarding claims 4 and 8, as discussed above with respect to claim 1,5 and Kobayakawa further teaches to generate a multi-path (MP1 to MP n of fig.3) for adding (combined) demodulation signal (see fig.3 co1.8 lines9-31).

Therefore, it would have been obvious to of ordinary skill in the art at the time the invention was made an antenna weight calculation based on the signal received by the respective antenna elements (as taught by Tanaka) to generate multi-path for adding

demodulation signal (as taught by Kobayakawa) to get higher efficient channel estimation and AAA compatible system.

Regarding claim 5, the rejection of claim 1 is herein incorporated. In addition, Tanaka discloses an adaptive antenna reception in which adaptively form the directional beam (beam former 77 of fig.7) of an array antenna (71-0 to 71(m-1) of fig.7) consisting of a plurality of antenna elements (#0 to #(m-11) of fig.7) is adaptively formed to receive a desired signal (i.e. signal coming from antenna) and reduces (i.e. suppress) interference signals, multiplexed (78 of fig.8) signals transmitted from a plurality of senders, and the desired signal is corrected based on transmission channel estimation (fig.7,col. 1 lines 8-29) comprising:

calculate the antenna weight coefficient (a0-a3 of fig.5) according to signals (z0 to z3 of fig.5) received by the respective antenna elements and an error signal (signal has a interference parameters) obtained from the desired signal corrected (calculated by weight coefficient unit 55 of fig.5) based on the receiver channel feedback information (i.e. transmission channel estimation)(see fig,l-7 col. 8 lines 38-48);

the adaptive antenna reception is used cross correlation function for calculating weighting coefficient (a0-a3 of fig.5) that indicate the arrival direction, and while matching the phase with the estimated arrival direction (i.e. maintain arrival angle constant or same) of the desired signal (see fig.4 and colo9 lines 39- 67).(since stable beam forming performed based on arrival direction which is depend on phase variation therefore, if phase matched with arrival and desired signal thereby maintain beam gain same or constant).

a beamformer (see fig.1) receiving the desired signal through the array antenna using the antenna weight which has undergone the cross correlation function(see fig. 1);

and estimating the transmission channel (at the channel receiver unit for transmission) of the desired signal received based on the estimation result (see fig.1-7.col. 10,lines 10-34).

But Tanaka failed to disclose explicitly constraint process. However, Kobayakawa teaches array antenna system (same field of endeavor) wherein plurality of antenna, adaptive weight control section calculates a adaptive weight s for obtaining in phase correlation signal from the respective antenna output (see fig.1 and abstract,col.6 lines 7-58).

Kobayakawa further teaches for calculating adaptive weights for each antenna elements using a directional constraint vector C and a covariance matrix which makes the phase of all correlation signal the same (i.e. constant) (see fig.9 step 204,.fig.12 A and col.5 lines 1-6,co1.10 lines 4-8,col. 11 lines 46-67,col. 2 lines 1-64).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the adaptive antenna weight calculation based on the signal received by the respective antenna elements (as taught by Tanaka) by adaptive weight calculation performed by adaptive weight control section using directional constraint technique to maintain desired signal phase same as arrival direction (i.e. gain same) (as taught by Kobayakawa) to enhance communication quality by reduction of interference using directional calculation constraint to calculate adaptive weight.

Regarding claim 6, as discussed above with respect to claim 5,Tanaka further discloses the adaptive antenna reception is used cross correlation function for calculating weighting coefficient (a0-a3 of fig.5) that indicate the arrival direction, and while matching the phase with the estimated arrival direction (i.e. maintain arrival angle constant or same) of the desired signal (see fig.4 and col. 9 lines 39- 67).

(since stable beam forming performed based on arrival direction which is depend on phase variation therefore, if phase matched with arrival and desired signal thereby maintain beam gain same or constant).

and Kobayakawa teaches for calculating adaptive weights for each antenna elements using a directional constraint vector C and a covariance matrix which makes the phase of all correlation signal the same (i.e. constant) in the arrival direction of the desired signal (see fig.9 step 204, fig.12 A and col. 5 lines 1-6,col. 10 lines 4-8,col. 11 lines 46-67,col. 12 lines 1-64).

Regarding claim 7, as discussed above with respect to claim 5 and 6 ,Tanaka furthermore discloses obtaining a correlation value between signals received by the respective adjacent antenna elements and calculating the average of the correlation values (see fig. 1,4 and col. 9 lines 1-9);

calculating the arctangent of the average correlation value (see fig.5 and col. 9 lines 25-38);

and arrival angle (phase) obtained from the correlation function which can be used for calculating a direction based on the arrival angle(see fig.4 and col. 9 lines 39-66).

Kobayakawa teaches for calculating adaptive weights for each antenna elements using a directional constraint vector C and a covariance matrix which makes the phase of all correlation signal the same (i.e. constant) in the arrival direction of the desired signal (see fig.9 step 204, fig.12 A and col. 5 lines 1-6,col. 10 lines 4-8,col. 11 lines 46-67,col. 12 lines 1-64).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MINH D. DAO whose telephone number is (571)272-7851. The examiner can normally be reached on 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MATTHEW ANDERSON can be reached on 571-272-4177. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MINH DAO
/MINH D DAO/
Examiner, Art Unit 2618